

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re application of:

OSWALD AND GREENSerial No: **09/552,576**Filed: **APRIL 19, 2000**

)
) Art Unit: **1724**
)
) Examiner: **BARRY, C.**
)
) Attorney Docket: **B215 1010.1**

For:

**METHOD AND APPARATUS TO ESTABLISH AND OPTIMIZE SEDIMENTATION
AND METHANE FERMENTATION IN PRIMARY WASTEWATER PONDS****DECLARATION UNDER 37 C.F.R. §1.132**

Commissioner for Patents and Trademarks
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

I, William J. Oswald, hereby state as follows:

1. I am an applicant in the above-identified patent application and a co-inventor of the subject matter claimed in this application.

2. I have been a research scientist for more than fifty-five years at the University of California at Berkeley and have performed both teaching and research in all aspects of wastewater treatment. I am an active Emeritus Professor in the School of Public Health and College of Engineering, Civil and Environmental Engineering, and currently recalled as Senior Research Scientist at the Lawrence Berkeley National Laboratory, Earth Sciences Division; I am a registered Civil Engineer in California and a certified diplomat in the American Academy of Environmental Engineering (please see attached *Curriculum Vitae*). My research has focused primarily on integrated systems that combine algae and bacteria as applied to energy- saving wastewater treatment and water reclamation; minimization of CO₂ emissions; solar energy

fixation, toxic waste treatment, and isolated life support systems. I am an author on over four hundred technical and scientific publications. Following six years of service in the U.S. Army, I entered the University of California at Berkeley and received my B.S. degree in Civil Engineering, my M.S. degree in Sanitary Engineering, and my Ph.D. degree in Civil and Environmental Engineering in 1950, 1951, and 1957, respectively.

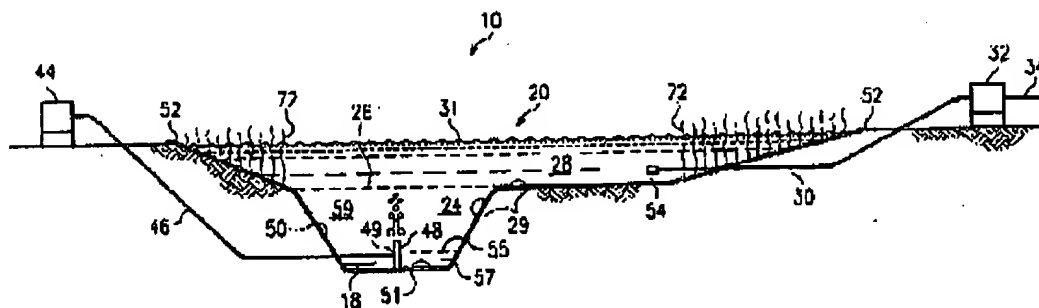
3. The invention claimed in the above-identified application relates to a method of disposing waste comprising, at least: 1) forming at least one primary waste pond (fermentation pit or methane fermentation zone) positioned within an outer pond; and 2) establishing a stable microbiological methane fermentation zone within a primary waste pond, wherein at least one of the primary waste ponds has a bottom that is at least 6 meters below a surface of the outer pond.

4. The primary reference cited by the Examiner against the claims of the present application is Oswald, W.J., *et al.*, "Performance of Methane Fermentation Pits in Advanced Integrated Wastewater Pond Systems," *Wat. Sci. Tech.*, 30(12): 287-295 (1994) (Oswald)(originally cited by the Examiner as an equivalent disclosure in the form of an electronic publication available on the Internet).

5. The Examiner acknowledged that Oswald failed to teach or suggest the recited element of the presently claimed invention, "wherein at least one of said primary waste ponds has a bottom that is at least 6 meters below a surface of said outer pond" See Applicants' specification, claim 1. However, the Examiner asserted that the acknowledged failure of Oswald to teach or suggest a "6 m depth limitation" was cured by U.S. Patent No. 6,068,773 to Sheaffer (Sheaffer), based on the disclosure of a pit having a depth of "14.5 ft," coupled with the comment that the depth "could be much greater;" and U.S. Patent No. 6,280,636 to Locklair (Locklair), based on the disclosure of "aerated pond pit depths of up to 25 ft." See the Office

Action at page 2-3. The Examiner asserted that the teachings of Sheaffer and Locklair were relevant and could be combined with the teachings of Oswald to provide the presently claimed invention. Neither Locklair nor Sheaffer disclose a zone in which significant methane fermentation can occur.

6. Regarding the Examiner's assertion that any teaching of depth in Sheaffer might be combined with the teaching of Oswald, the following observations are provided. Sheaffer teaches throughout that the majority of the volume of the "treatment cell 24" is aerated. See Fig. 2 from Sheaffer below.



Sheaffer describes the features of the treatment cell having to do with aeration as follows:

Continuing to refer to FIGS. 1 and 2, an aeration blower 44 is provided to blow the air through an aeration pipe 46 to an aerator 48. Inherently during its operation, blower 44 compresses intake air and as it does so, it heats the intake air. This contributes to an elevation in pond temperature. An end 49 of the aeration pipe 46 is placed from one to two feet above the bottom 51 of the treatment cell 24, and at least eight to ten feet below elevation 26, which is the demarcation between cell 24 and storage volume 28. An aerator 48 is situated over pipe end 49 so as to distribute injected air into a helical pattern. Pipe end 49 and aerator 48 preferably are sited at a central location in cell 24. The aeration blower 44 is sized and operated to provide a volume of air which is at least 1500 cubic feet as measured at standard temperature and pressure (STP), and preferably at least 2500 cubic feet of air, to the treatment cell 24 for every pound of BOD₅ in the wastewater to be converted.

7. When Sheaffer refers to an "anaerobic zone," it is referring to the relatively small zone that is "located below the air conduit." Sheaffer at col. 2, lines 53-54. Sheaffer states that "the air conduit end ["pipe end 49" in the foregoing passage and drawing] is positioned to be one to two feet from the bottom of the treatment cell" Sheaffer at col. 2, lines 49-50. Sheaffer also explicitly states that "[t]he rest of the treatment cell is occupied by a heavily aerated aerobic zone in which anaerobic pathogens are killed by oxygen." Sheaffer at col. 2, lines 55-57. Based on the foregoing statements in Sheaffer, one of skill in the art would recognize that Sheaffer does not disclose an *anaerobic area or methane fermentation zone* other than that relatively small, short space below the air conduit end, comprising only the space "one to two feet from the bottom of the treatment cell." The fundamentals of methane fermentation indicate that only a feeble fermentation, if any, could occur in such a zone.

8. Oswald relates to a method of using methane fermentation in ponds or pits for waste treatment. Methane fermentation in the pond or pit is inconsistent with *aeration* in the method and apparatus taught by Sheaffer. One of ordinary skill in the art would not be motivated to combine any teaching of Sheaffer with any method involving a pit or pond devoted primarily to methane fermentation, *e.g.*, as taught by Oswald, because methane fermentation requires substantially *anaerobic* conditions. Sheaffer discloses aeration *no more than one or two feet above the bottom of the "treatment cell,"* as discussed above. Accordingly, no teaching of overall depth of the "treatment cell" is relevant to the present invention. The only arguably relevant depth is the one or two feet depth beneath the air conduit, and even this portion of Sheaffer's treatment cell should be considered irrelevant in view of the teaching of mixing in this zone by the entrainment of streams of water leading to mixing, a condition inconsistent with

stable methane fermentation. See, e.g., Sheaffer's teaching that bubbles from the aerator "entrain streams of wastewater upward . . ." in the description of Fig. 3, at col. 5, lines 64-65.

9. Regarding the Examiner's assertion that any teaching of depth in Locklair might be combined with the teaching of Oswald, the following observations are provided. Locklair discloses one large, *completely aerated* pond. The abstract of Locklair states that the invention provides a "method and apparatus of increasing the oxygen transfer rate, residence time, and circulation pathways within wastewater" Locklair repeatedly and consistently teaches increased aeration throughout the pond. Because Oswald teaches methane fermentation, *a process dependent upon substantially anaerobic conditions within the disclosed ponds or pits*, no one of ordinary skill in the art would have considered combining any teaching of pond depth in Locklair with the teaching of Oswald.

10. The present invention has yielded unexpected results. As noted, the presently claimed invention relates to the establishment of stable microbiological methane fermentation zone within primary waste ponds (inner ponds, fermentation pits, methane fermentation zones) wherein the pits or ponds have "a bottom that is at least 6 meters below a surface of said outer pond" During the development of the present invention, the importance of having a depth of at least six meters below the pond surface was not initially recognized. The establishment and maintenance of a stable methane fermentation zone was found to depend on pond/pit depth, and having "a bottom at least 6 meters below the surface" of an outer pond achieved the unexpected results. It was discovered that a depth of at least six meter below the pond surface unexpectedly resulted in the establishment and maintenance of meromixis¹, that is, maintenance of a zone that is particularly stable and anaerobic due to the increased pressure of depth and solids settling

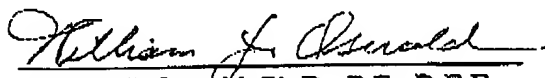
¹ See Hutchinson, G.E. (1957). A Treatise on Limnology. Vol. 1, Geography, Physics, and Chemistry, John Wiley & Sons, Inc., New York, pp. 1,015.

velocities that are higher than the influent upflow velocities. It appears that increased pressure commensurate with the minimum depth recited in the claims establishes and maintains the desirable conditions of meromixis. Although not wishing to be bound by any particular theory, it appears that the surprising advantages obtained by constructing a pond or pit for methane fermentation having a bottom that is at least six meters below the pond surface may be due primarily to a combination of 1) the substantial exclusion of dissolved oxygen, *e.g.*, by lowering the possibility of wind-induced mixing using greater depths such as the presently claimed minimum of 6 meters; and 2) the compression of settleable solids to increase their rate of sedimentation.

11. It should be noted that the nutritional requirements of microbiological organisms responsible for methane fermentation are known to be unpredictable. Consequently, the environment influences their activities in unexpected ways. Unexpectedly, the advantageous fermentation results obtained by the present invention were discovered to be dependent upon ponds or pits having bottoms at least six meters below the pond surface. In contrast, one of ordinary skill in the art would be motivated generally to *minimize* the depth of the pit or pond because of added costs associated with construction of ponds of greater depth.

12. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

07/02/04
Date:


William J. Oswald, Ph.D., P.E., D.E.E.



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Professor Emeritus

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Biomedical and Environmental Health Sciences, School of Public Health

Civil and Environmental Engineering, College of Engineering

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Education

- Bachelor of Science - Civil Engineering
University of California
- Master of Science - Sanitary Engineering
University of California
- Doctor of Philosophy - Sanitary Engineering, Biology, and Public Health
University of California

Professional

- Emeritus Professor, University of California, Berkeley
- Registered Civil Engineer, State of California
- Sanitary Engineering Director, U.S. Public Health Service (Inactive Reserve)
- American Academy Environmental Engineers, AAEE Certified

Affiliations

- American Academy of Environmental Engineers, Diplomate
- American Society of Civil Engineers, Fellow, Life Member
- American Association for the Advancement of Science (Fellow)
- American Water Works Association, Life Member
- New York Academy of Science
- Water Pollution Control Federation, Life Member
- Interamerican Society of Sanitary Engineers
- International Cell Research Organization

Honorary Societies

- Chi Epsilon
- Sigma Xi
- Tau Beta Pi
- Delta Omega

Awards and Honors

- Distinguished Environmental Biotechnologist Award, International Society for Applied Biotechnology, 2002.
- Award for Continued and Outstanding Contributions to the Field of Phycology, International Society for Applied Phycology, 2002.
- Special Services Award, Sankat Mochan Foundation and Friends of the Ganges, USA
- Fellow in the American Academy for the Advancement of Science
- Fellow in the American Academy of Environmental Engineering (Life)
- Water Pollution Control Federation: Harrison Prescott Eddy Medal for Noteworthy Research.
- American Society of Civil Engineers:

Outstanding Faculty Award (Student Chapter); James Croes Medal (National); Rudolf Hering Medal (National); Arthur M. Wellington Award (National)

- U.S. Bureau of Reclamation, The Environmental Protection Agency and the Department of Water Resources: Special Commendation for Excellence of Consulting Services on Interagency Central Valley Drainage Project.
- Council for Agricultural Planning and Development, Republic of China: Distinguished Paper Commendation.
- National Science Foundation, United States Agency for International Development, World Health Organization: International scientific committees, research collaborations, and invited lectures.

Specialties

- Sanitary/Environmental Engineering
- Applied Phycology
- Microbial Waste Management Systems
- Environmental Systems Engineering

Experience

- **Teaching** - Emeritus Professor of Biomedical and Environmental Health Sciences in the School of Public Health and Civil and Environmental Engineering in the College of Engineering, University of California, Berkeley. Professor Oswald has taught course in Water Resource Engineering; Water Quality; Principles of Sanitary Engineering; Environmental Health Sciences; Public Health Aspects of Water and Wastewater Treatment; Biological Control Systems; Pond Design; Applied Phycology. He served as Core Faculty in the Agricultural and Environmental Chemistry Program in the College of Natural Resources; he was an Affiliated Faculty in the Energy & Resources Group; and, he was Faculty Adviser in the new program and department of Bioengineering. Professor Oswald has given dozens of courses during the 1990s for the American Society of Civil Engineers Continuing Education Program. He is an expert in water quality management and low-cost appropriate technology for wastewater treatment, disposal and reuse systems, anaerobic digestion, solar energy applications and alternative energy resource recovery systems. He has been the major faculty adviser for more than 50 M.S., M.Eng. and M.P.H. students and more than 25 Ph.D. and D.P.H. students.
- **Research Engineer** - In addition to responsibilities associated with his university emeritus professorship, has had more than fifty international, federal, state and local research and development grants as a Research Engineer to study various aspects of microbiological systems for waste treatment, environmental control, energy production, methane fermentation, fertilizer production, pharmaceutical production, water and nutrient reclamation, and toxic waste treatment. Current research involves applications of Advanced Integrated Wastewater Pond Systems for energy conservation and toxicant removal.
- **Professional Engineer** - Has provided system designs for more than 50 successful wastewater management systems. Currently consulting for the U.S. Agency for International Development on municipal wastewater infrastructure for the City of Varanasi, India. Has provided advisory, review and consultative services for more than 35 years on water supply and waste management systems, biological engineering and environmental control to the World Health Organization, The Pan American Health Organization, the United Nations Environmental Program, the International Bank for Reconstruction and Development (World Bank), the Asian Development Bank, the U.S. Agency for International Development, the U.S. Army, Navy and Air Force, the U.S. Bureau of Reclamation, United States Congress, House and Senate, Office of the President, U.S. Public Health Service, U.S. Department of the Interior, U. S. Department of Agriculture, the National Academy of Sciences, the National Academy of Engineering, the National Aeronautic and Space Administration, the California State Legislature and California State Department of Water Resources; the Oceanic Institute of Hawaii, the governments of Australia, Bolivia, Brazil, Chile, Colombia, Cuba, Czechoslovakia, Egypt, France, Germany, Hungary, India, Israel, Jamaica, Mexico, People's Republic of China, Philippines, Portugal, Puerto Rico, Russia, Singapore, Sweden, Taiwan, Tunisia, and Venezuela, as well as over 100 local agencies and private firms. Professor Oswald is known internationally as one of the world's foremost authorities on waste stabilization ponds, high rate

ponds, methane fermentation, microalgal production, water reclamation nutrient recycle, and toxicity control.

- **Inventor** - Inventor of Advanced Integrated Wastewater Pond Systems, High Rate Ponds, AlgaTron, Photosynthetic Oxygenation, *Porphyridium cruentum*.
- **Writer** - Professor Oswald has authored over 400 papers, articles and reports published in professional journals, books and trade publications throughout the world. A list of publications, reports, and presentations since 1990 follows. The complete list since 1950 is available upon request.

Selected Recent Publications and Presentations

"Low cost wastewater reclamation using the Advanced Integrated Wastewater Pond System Technology and reverse osmosis" with Downing, J.B., E. Bracco, F.B. Green, A.Y. Ku, T.J. Lundquist, and I.X. Zubieta, *Water Science and Technology*, Vol. 45, No. 1, pp. 117-125. (2002).

"My Sixty Years in Applied Algology." Keynote address, Ninth International Conference on Applied Algology. May 26-31, 2002, Almeria, Spain, *Journal of Applied Phycology*, Vol. 15, No. 99, pp. 99-106, (2003).

"Advances in Drainage Treatment with the Algal-Bacterial Selenium Removal Process," presentation to DWR staff, November 13, 2002, Panoche Drainage District.

Irrigation Drainage Water Treatment for Selenium Removal: Panoche Drainage District Demonstration Facility with Lundquist, T.J., F.B. Green, N.W.T. Quinn, S.E. Borglin, G.A. Anderson, and I.X. Zubieta, Final Report and Year 3 Annual Report, CALFED Bay-Delta Program, 1416 Ninth St., Suite 1155, Sacramento, CA 95814, pp. 110 (2002).

"Selenium and nitrate removal from agricultural drainage using the AIWPS Technology," with Green, F.B., T.J. Lundquist, N.W.T. Quinn, M.A. Zárate, and I.X. Zubieta. Fifth International Water Association Specialist Conference on Waste Stabilization Ponds, *Pond Technology for the New Millennium*, April 2-5, 2002, Auckland, New Zealand, *Water Science and Technology*, Vol. 48, No. 2, pp. 299-305, (2003).

"Development of Drainage Treatment for the San Joaquin River Water Quality Improvement Project" with Lundquist, T.J., F.B. Green, N.W.T. Quinn, C. Hsieh, and S.E. Borglin, *DWR Project Update Meeting*, March 27, 2002, Sacramento.

"AIWPS® Technology for Tropical Environments" with F.B. Green and T.J. Lundquist. Plenary lecture, Sixth International Symposium on Environmental Biotechnology and the Fourth International Symposium on Cleaner Bioprocesses and Sustainable Development, June 9-12, 2002, Veracruz, México.

Demonstration of Selenium and Nitrate Removal from Tile Drainage Using the Algal-Bacterial Selenium Removal Process: Facility Interim Studies with F.B. Green, T.J. Lundquist, M.A. Zárate, I.X. Zubieta, and A.Y. Ku, report prepared for the U.S. Bureau of Reclamation, Mid-Pacific Region, pp. 84, (2001).

"Potential for high altitude application of biological treatment for selenium and nitrate removal" with Lundquist, T.J., M.A. Zárate, and F.B. Green. Presentation for the Gunnison Basin Selenium Task Force at *Selenium Symposium 2000: Remediation Technologies and Research*, June 28, 2000, Montrose, Colorado.

"Demonstration of Selenium and Nitrate Removal from Tile Drainage Using the Algal-Bacterial Selenium Removal Process: Facility Interim Studies" with Green, F.B., T.J. Lundquist, M.A. Zárate, I.X. Zubieta, and A.Y. Ku. Report prepared for the U.S. Bureau of Reclamation, Mid-Pacific Region, pp. 84 (2000).

- Irrigation Drainage Water Treatment for Selenium Removal: Panoche Drainage District Demonstration Facility* with Lundquist, T.J., M.A. Zárate, F.B. Green, A.R. Brent, A.Y. Ku, and X.I. Zubieta, 1999-2000 Annual Report prepared for the CALFED Bay-Delta Program, pp. 117 (2000).
- "Performance of an algal-bacterial selenium-removal system in the San Joaquin Valley of California" with M.A. Zárate, T.J. Lundquist, S. Mountford, N.T.W. Quinn, F.B. Green, and T.J. Leighton, *219th American Chemical Society National Meeting*, March 26-30, San Francisco (2000).
- "Selenium determination in agricultural drainage treated in an algal-bacterial selenium-removal system in the San Joaquin Valley of California" with M.A. Zárate and S. Mountford, *219th American Chemical Society National Meeting*, March 26-30, San Francisco (2000).
- Advanced Integrated Wastewater Pond Systems and the Suitability of the AIWPS Technology and India and South Asia*, with F.B. Green. United States Agency for International Development, Regional Urban Development Office, New Delhi, India, pp. 60 (2000).
- Drainage Treatment Bulletin*, research update for the Panoche Drainage District Algal-Bacterial Selenium Removal Facility, pp. 2 (2000).
- "Selenium and other toxic metals removal using the AIWPS® Technology" with M.A. Zárate, T.J. Lundquist, I.X. Zubieta, A.Y. Ku, and F.B. Green, presented at *The 1st IWA Latin American Conference on Waste Stabilization Ponds and Reuse*, October 24-27, Cali, Colombia (2000).
- "Low cost wastewater reclamation using the AIWPS Technology and reverse osmosis" with Downing, J.B., T.J. Lundquist, I.X. Zubieta, E. Bracco, and F.B. Green, presented at the *IWA 1st Latin American Specialist Conference on Waste Stabilization Ponds and Reuse*, October 24-27, 2000, Cali, Columbia.
- "Algal-bacterial treatment facility removes selenium from drainage water" with N.W.T. Quinn, T.J. Lundquist, F.B. Green, M.A. Zárate, and T.J. Leighton, *California Agriculture*, Vol. 54, No. 6, pp. 50-56, (2000).
- "Current and Proposed Wastewater Infrastructure in India's Oldest City: Cleaning the Ganges at Varanasi" with F.B. Green, Fourth IAWQ Waste Stabilization Ponds Specialist Conference *Technology and the Environment*, April 20-23, Marrakech, Morocco, (1999).
- Irrigation Drainage Water Treatment for Selenium Removal: Panoche Drainage District Demonstration Facility* with Lundquist, T.J., M.A. Zárate, F.B. Green, A.R. Brent, and A.Y. Ku, 1998-1999 Annual Report prepared for the CALFED Bay-Delta Program, pp. 141 (1999).
- "Algal-Bacterial Selenium Removal Process" with Lundquist, T.J., M.A. Zárate, F.B. Green, A.R. Brent, and A.Y. Ku, contribution to *Task 2 Drainage Water Treatment* Final Report prepared by Drainage Water Treatment Technical Committee, San Joaquin Valley Drainage Implementation Program (California Department of Water Resources) and the Salinity/Drainage Program (University of California), February 1, pp. 4 (1999).
- "Energy Efficiency and Carbon Management: Ingredients for Sustainable Wastewater Technology" with F.B. Green and T.J. Lundquist, to be published in the proceedings of Fourth IAWQ Waste Stabilization Ponds Specialist Conference *Technology and the Environment*, April 20-23, Marrakech, Morocco, (1999).
- "The Application of the AIWPS® Technology to Chemically Contaminated Agricultural Drainage Water" with M.A. Zárate, T.J. Lundquist, F.B. Green, A.R. Brent, and A.Y. Ku, to be published in the proceedings of Fourth IAWQ Waste Stabilization Ponds Specialist Conference *Technology and the Environment*, April 20-23, Marrakech, Morocco, (1999).
- The Algal-Bacterial Selenium Removal System for Treatment of Irrigation Drainage Water: Demonstration Facility Interim Studies* with T.J. Lundquist, M.A. Zárate, F.B. Green, A.R. Brent, and A.Y. Ku. Final Report prepared for the Water Treatment and Technology Program, U.S. Bureau of Reclamation, Denver, Colorado, pp. 79 (1999).

Wastewater Treatment, Reclamation and Reuse Feasibility Study Using the Combination of the AIWPS® Technology and the Expertise S.r.l. Reverse Osmosis Technology with J.B. Downing, T.J. Lundquist, and F.B. Green, Final report prepared for Expertise, S.r.l., Milan, Italy, pp. 95 (1999).

"Application of Advanced Integrated Wastewater Pond Systems® in California" with F.B. Green and T.J. Lundquist, presented at *The Asian Conference on Water and Wastewater Management*, March 3, Tehran, Iran, (1998).

"Achieving Title 22 Quality with Advanced Integrated Wastewater Pond Systems" with F.B. Green and T.J. Lundquist, presented at the *Annual UC Water Reuse Research Conference*, June 4 and 5, Monterey, California, (1998).

"Carbon Sequestration during Photosynthetic Oxygenation of Liquid Organic Wastes," *Carbon Sequestration Workshop*, June 22 - 23, Massachusetts Institute of Technology, Cambridge, Massachusetts, (1998).

"Selenium Removal in Agricultural Drainage Water in the San Joaquin Valley of California" with M.A. Zárate, T.J. Lundquist, A.R. Brent, and F.B. Green, presented at the *International Symposium on Science and Technology: Bolivia Third Millennium*, September 15-19, Cochabamba, Bolivia, (1998).

"Selenium Removal in Agricultural Drainage Water Using an Advanced Integrated Wastewater Pond System" with M.A. Zárate, T.J. Lundquist, A.R. Brent, and F.B. Green, to be presented at the *XXVI Congress of the Inter-American Association for Sanitary and Environmental Engineering*, November 1-5, Lima, Peru, (1998).

"Progress at the Algal-Bacterial Selenium Removal Facility in the Panoche Drainage District" with A.R. Brent, R.J. Craggs, F.B. Green, T.J. Lundquist, M.A. Zárate, and S.L. Ng, presentation at the U.S. Bureau of Reclamation *Biannual Groundwater Workshop*, March 20, Sacramento, California, (1997).

"Problems and Prospects for Full-Scale Selenium Removal" with A.R. Brent, R.J. Craggs, F.B. Green, T.J. Lundquist, M.A. Zárate, and S.L. Ng, presentation at the U.S. Bureau of Reclamation *Biannual Groundwater Workshop*, March 20, Sacramento, California, (1997).

"The Algal-Bacterial Selenium Removal Facility in the Panoche Drainage District" with A.R. Brent, R.J. Craggs, F.B. Green, T.J. Lundquist, M.A. Zárate, A. Yee, and S.L. Ng, presentation at the American Water Resources Association Annual Conference on Water Resources and Symposium on *Conjunctive Use of Water Resources: Aquifer Storage and Recovery*, October 19-23, Long Beach, California, (1997).

"A Controlled Stream Mesocosm for Tertiary Treatment of Sewage" with R.J. Craggs, W.H. Adey, and B.K. Jessup, *Ecological Engineering*, Vol. 6, No. 1-3, May, pp. 149-169, (1996).

"Advanced Integrated Wastewater Pond Systems for Nitrogen Removal" with F.B. Green, T.J. Lundquist and L.S. Bernstone. In: *Water Science and Technology*, Vol. 33, No. 7, pp. 207-217, (1996).

"Phosphorus Removal from Wastewater Using an Algal Turf Scrubber" with R.J. Craggs, W.H. Adey, K.R. Jenson, M.S. St. John, F.B. Green. In: *Water Science and Technology*, Vol. 33, No. 7, pp. 191-198, (1996).

"Tube Settling of High Rate Pond Algae" with Y. Nurdogan. In: *Water Science and Technology*, Vol. 33, No. 7, pp. 229-241, (1996).

The Capture and Utilization of Methane from Advanced Integrated Wastewater Pond Systems with F.B. Green and T.J. Lundquist, Final Report to the California Energy Commission, Sacramento, California, Environmental Engineering and Health Sciences Laboratory Report No. 96-1, pp. 266 plus appendices, pp. 198, (1996).

- "A New Approach to Waste Management Technologies for Less Developed Countries: The Wastewater Management Sector" with M.A. Zárate and F.B. Green, In: *The Proceedings of the World Environmental Congress*, October 26-29, Cincinnati, Ohio, (1996).
- "Optimization of the Wastewater Treatment System for the City of Tarija, Bolivia" with M.A. Zárate and F.B. Green, In: *Proceedings of V Congreso de AIDIS*, November 3-7, Mexico City, (1996).
- Demonstration of Selenium and Nitrate Removal from Panoche Drainage District Tile Drainage Using the Algal-Bacterial Treatment Process* with F.B. Green, T.J. Lundquist, and M.A. Zárate, First Interim Report to the U.S. Bureau of Reclamation and Lawrence Berkeley National Laboratory, Environmental Engineering and Health Sciences Research Laboratory Report No. 95-2, pp. 33 (1995).
- "Ponds in the Twenty-First Century." In: *Water Science and Technology*, Vol. 31, No. 12, pp. 1-8, (1995).
- "Energetics of Advanced Integrated Wastewater Pond Systems" with F.B. Green, and T.J. Lundquist. In: *Water Science and Technology*, Vol. 31, No. 12, pp. 9-20, (1995).
- "Enhanced Nutrient Removal in High Rate Ponds," with Y. Nurdogan. In: *Water Science and Technology*, Vol. 31, No. 12, pp. 33-43, (1995).
- "Methane Fermentation, Submerged Gas Collection, and the Fate of Carbon in Advanced Integrated Wastewater Pond Systems" with F.B. Green, L. Bernstone, T.J. Lundquist, J. Muir, and R.B. Tresan. In: *Water Science and Technology*, Vol. 31, No. 12, pp. 55-65. (1995).
- "Economic, Regulatory, and Political Considerations for Upgrading Waste Stabilization Ponds and for the Selection of Wastewater Treatment Technology" with F.B. Green. Plenary Lecture presented at the *Third IAWQ International Specialist Conference on Waste Stabilization Ponds Technology and Applications*, March 27-31, 1995, Joao Pessoa, Paraiba, Brazil.
- "Comparison of the Energy Requirements for Advanced Integrated Wastewater Ponding Systems with Several Mechanical Wastewater Treatment Processes" with F.B. Green, T.J. Lundquist, and M.A. Zárate. Presented at the *Third IAWQ International Specialist Conference on Waste Stabilization Ponds Technology and Applications*, March 27-31, 1995, Joao Pessoa, Paraiba, Brazil.
- "Advanced Integrated Wastewater Pond Systems for Nitrogen Removal" with F.B. Green, and T.J. Lundquist. Presented at the *Third IAWQ International Specialist Conference on Waste Stabilization Ponds Technology and Applications*, March 27-31, 1995, Joao Pessoa, Paraiba, Brazil.
- "Performance of Methane Fermentation Pits in Advanced Integrated Wastewater Pond Systems," with F. B. Green, T.J. Lundquist. *Proceedings of the IAWQ Seventh International Symposium on Anaerobic Digestion*, Cape Town, South Africa, January 23-27, 1994. In: *Water Science Technology*, Vol. 30, No. 12, pp. 287-295, (1994).
- Evaluation of the Algal Turf Scrubber/UV System for Tertiary Wastewater Treatment at Patterson, California* with R.J. Craggs, W.H. Adey, K.R. Jensen, M. St. John, F.B. Green, and T.J. Lundquist, First Interim Report, Environmental Engineering and Health Sciences Laboratory Report No. 94-1, pp. 50, (1994).
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